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·防治实践·

上颌磨牙远颊根行显微根尖外科手术保存活髓病例报告及文献复习

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【摘要】 目的 探讨非牙源性根尖周病变患牙的诊断、治疗和预后，为该类疾病的诊治提供参考。**方法** 回顾性分析四川大学华西口腔医院收治的1例右上磨牙活髓伴根尖透射影合并局部牙骨质结构不良的病例，并结合文献对显微根尖手术与活髓保存术后疗效进行分析。**结果** 16活髓，影像学特征表现为远颊根根尖区透射影合并局部阻射影，局麻下行显微根尖外科手术，术中见远颊根尖区软组织覆盖，未探及高密度阻射影组织，截取远颊根根尖3 mm，超声倒预备，无机三氧化物聚合物（mineral trioxide aggregate，MTA）倒充填，置骨粉胶原膜后严密缝合；术后病理结果见纤维结缔组织样病变；术后1周复查，影像检查显示倒充填严密，根尖区未见透射影，牙髓活力电测试正常；术后4年复查，16无变色，牙髓活力温度测试、电测试与对照牙无明显差异。结合临床表现、影像学特征、手术探查以及病理学报告，该病例临床诊断为16根尖区牙骨质结构不良。通过文献回顾分析发现，在保存牙齿的前提下，通过显微根尖外科手术治疗该类病例并保留健康的牙髓组织，目前尚未见相关文献报道。**结论** 对存在根尖周病变但牙髓健康的上颌后牙，通过对牙髓状态的准确判断、显微根尖外科探查术以及生物活性材料的应用，可在去除病变的同时实现对患牙的活髓保存。

【关键词】 活髓保存；　根尖周病；　牙髓源性；　显微根尖外科手术；　激光多普勒血流仪；　无机三氧化物聚合物；　牙骨质结构不良
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Case report and literature review of vital pulp preservation by endodontic microsurgery at the distal buccal root of maxillary molar

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【Abstract】 Objective To investigate the diagnosis, treatment and prognosis of nonodontogenic periapical lesions and to provide a reference for clinical diagnosis and treatment. **Methods** A case of a patient with right upper molar pulp with apical penetration and local occlusion admitted to the West China Stomatological Hospital of Sichuan University was retrospectively analyzed, and the curative effect of microapical surgery and pith preservation was also analyzed. **Results** The imaging features of tooth 16 showed periradicular radiolucency combined with local radiopaque lesions around the distal buccal apical area. Endodontic microsurgery was performed under local anesthesia. Soft tissue coverage was observed in the distal buccal apical area during the surgery, and no radiopaque tissue was detected. The distal buccal root apex was cut by 3 mm, and mineral trioxide aggregate was used for root-end backfilling. The postoperative pathological results revealed fibrous connective tissue. One-week recall X-ray examination showed tight root-end back-

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filling and no periradicular radiolucency; an electrical test of pulp vitality showed positive results. The four-year follow-up showed that there was no discoloration in tooth 16 and no significant difference in thermal and electrical tests of pulp vitality compared with control teeth. Combining the clinical manifestations, imaging features, surgical exploration results and pathological reports, the case was most likely to be cemental hypoplasia. Through the literature review, the treatment and healthy pulp preservation of such cases by endodontic microsurgery under the premise of preserving teeth has not been reported. **Conclusion**　For maxillary posterior teeth with periapical lesions but healthy pulp, accurate estimation of pulp status, endodontic microsurgical exploration and application of bioactive materials can achieve vital pulp preservation while removing the lesions.

【Key words】 vital pulp preservation;　periapical disease;　dental pulp origin;　endodontic microsurgery;　laser doppler flowmetry;　mineral trioxide aggregate;　cemental hypoplasia
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根尖周病变为牙体牙髓常见疾病，但并非所有病变均为牙髓源性，对牙髓状态准确评估之前草率对患牙行根管治疗，可能导致误诊误治甚至延误病情。过去对于牙髓健康的磨牙，当一个牙根周围出现病变时，如果需要保留患牙，则首先对患牙进行根管治疗，然后行根尖外科手术以及冠修复，这样牙齿将失去活力，变为无髓牙，直接影响患牙的抗折强度和寿命[1-2]。对于这类病例，在保存牙齿的前提下，能否通过手术治疗保留健康的牙髓组织，尚未见文献报道。本病例为牙髓健康的上颌后牙存在根尖区透射影合并局部阻射影，通过显微根尖外科手术以及应用生物活性材料，去除病变的同时成功实现了对患牙的活髓保存。

1　病例资料

1.1　一般资料

患者，女，24岁，2013年11月因正畸需求于四川大学华西口腔医院正畸科就诊，拍摄锥形束计算机断层扫描（cone-beam computed tomography，CBCT）后发现16根尖区阴影合并局部高密度阻射影，外科会诊后未明确诊断，拟行探查手术，遂转诊本院牙体牙髓病科。患者否认全身系统病史，否认家族系统疾病史、肝炎等传染性疾病、药物过敏史，否认疼痛、肿胀、敏感及正畸治疗史、外伤史。

1.2　临床检查

口外检查：颜面对称，张口度正常，下颌无偏斜，颞下颌关节无弹响，无压痛，未触及肿大淋巴结。口内检查：16牙体完整，未见龋坏、隐裂及充填物，牙齿未见变色，未触及病理性松动，垂直向及侧向叩痛（-），牙龈健康，根尖区扪诊无颌骨肿胀及疼痛；牙髓活力温度测试、电测试与26无明显差异。激光多普勒血流仪（laser doppler flowmetry，LDF）及组织氧气监护仪（tissue oxygen monitor，OXY）示16为正常活髓牙（表1）。

1.3　辅助检查及诊断

CBCT检查显示：16远颊根根尖周存在透射影，混杂有一密度均匀并环绕根尖1/3区域的阻射影；远颊根根尖周牙周膜及硬骨板影像消失，牙根无吸收；透射影边界清晰，紧邻上颌窦，但未与上颌窦通联；阻射影未与远颊根融合（图1a～c）。初步诊断为16根尖区牙骨质结构不良。因患者保牙愿望强烈，对病变性质存在担忧，在与患者沟通交流后，拟行16显微根尖手术探查暗影并尝试保留该牙活髓。告知手术风险及预后，签署手术同意书。

1.4　方法

局麻下行16显微根尖外科手术，术中翻瓣后，见16远颊根尖区病变软组织覆盖，去骨，仔细探查根尖区软组织腔隙，未探及CBCT影像中高密度阻射影组织，去净软组织，送病检，截取远颊根根尖3 mm，超声倒预备，充分止血隔湿，无机三氧化物聚合物（mineral trioxide aggregate，MTA）倒充填，置骨粉胶原膜后严密缝合。

2　结　果

术后1周复查，X线片示MTA倒充填严密，根尖未见透射影，牙髓活力电测试正常，LDF及OXY数值见表1，病理检查可见一些纤维结缔组织样病变，疑似牙骨质结构不良。

患者术后4年复查，自述4年来无疼痛史，口内检查16牙齿未见变色、无松动，叩痛（-），牙龈健康，根尖区扪诊无颌骨肿胀及疼痛，牙髓活力温度

测试、电测试与对照牙26无明显差异，LDF及OXY数值见表1。X线片示16根尖周骨质致密，远颊根根尖周牙周膜样影像形成（图1d～h）。

表1　上颌磨牙远颊根行显微根尖外科手术保存活髓术前、术后的激光多普勒血流仪和组织氧气监护仪检查

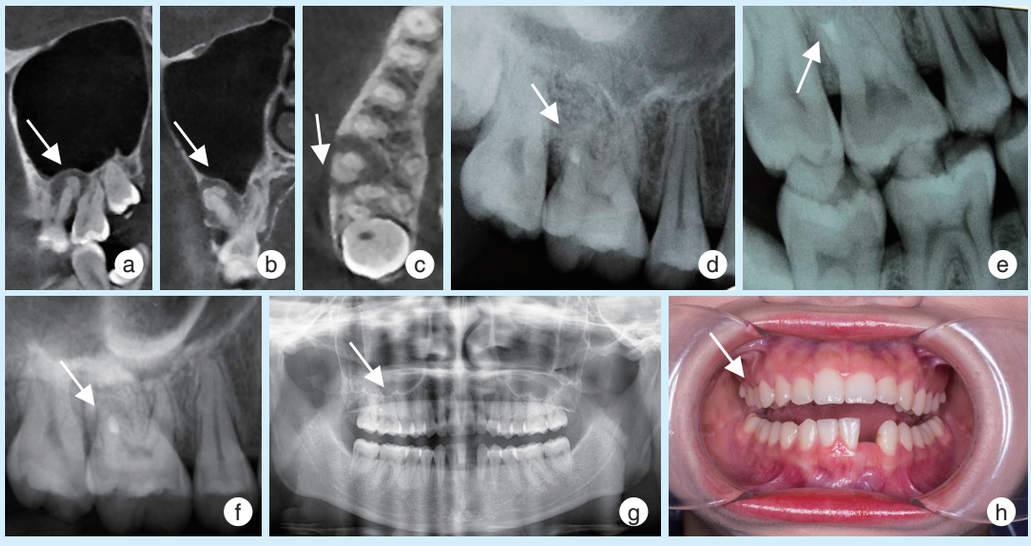
Table 1　Preoperative and postoperative laser Doppler flowmeter and tissue oxygen monitor were performed of vital pulp preservation by endodontic microsurgery at the distal buccal root of maxillary molar

Time	Tooth 16/Tooth 26		
	Blood flow（PU）	SO_2（%）	Hemoglobin（AI）
Preoperation	11.5/11.8	80/82	350.2/337.2
1-week follow-up	10.3/12.7	69/79.5	689.0/330.1
4-years follow-up	11.6/12.0	83.5/85	310.3/328.7

PU and AI are the units of blood flow and hemoglobin

3　讨　论

根尖周区病变虽为牙体牙髓常见疾病，但有些病变不一定是牙髓源性病变，许多合并根尖周病变的患牙本身也为牙髓健康的牙齿。本病例中，患牙虽然存在根尖暗影，但其牙体完整，牙髓仍健康，不典型的根尖区病变给诊断和治疗的选择带来了困惑。首先，该牙为活髓牙，无疼痛史，且牙完整，牙齿无颜色改变，未发现龋坏、隐裂、充填物等可导致根尖周感染的因素存在，故而排除牙髓源性根尖周病变的可能性。其次，该牙牙根完整，无不规则吸收，透射影的轮廓规则；无牙周病及牙齿松动；无区域性的神经麻木；病变也未穿透皮层浸润到软组织，无日光放射状骨膜反应，因而可排除绝大多数侵袭性颌骨肿瘤[3]。此外成牙骨质细胞瘤多表现为与受累牙牙根相融合的均匀



a～c：white arrows indicate the apical lesion of tooth 16；d～f：white arrows indicate distal buccal root backfilling and the periapical area of tooth 16；g～h：white arrows indicate tooth 16

a：sagittal view of preoperative CBCT shows that tooth 16 had a periradicular radiolucent area in the distal buccal root with a clear boundary，adjacent but not connected to the maxillary sinus，combined with a local radiopaque lesion；the images of the periodontal membrane and cortical bone plate disappeared with no root absorption was observed；b：coronal view of preoperative CBCT showed buccal bone plate destruction；the radiopaque lesion was surrounded in the apical 1/3 of the distal buccal root without fusion with the root；c：horizontal view of preoperative CBCT shows the radiopaque lesion located in the distal buccal root；d：1-week follow-up X-ray showed tight MTA backfilling with no periradicular radiolucency of tooth 16；e：bitewing at the 1-week follow-up in tooth 16；f：4-year follow-up X-ray showed the formation of new periradicular bone and periodontal membrane of tooth 16；g：4-year follow-up panoramic film（orthodontic treatment has been completed）shows that the distal buccal apex of tooth 16 was backfilled well with no periradicular radiolucency，and a smooth maxillary sinus floor with no thickening of the maxillary sinus mucosa was observed；h：4-year follow-up，the color of the crown of tooth 16 was not different from the adjacent teeth

Figure 1　Vital pulp preservation by endodontic microsurgery at the distal buccal root of maxillary molar

图1　上颌磨牙远颊根行显微根尖外科手术保存活髓

或不均匀高密度团块影，周围有清晰的低密度带状包膜影，牙根轮廓模糊，可有根吸收，并多发生于下颌前磨牙及磨牙根尖区域，可初步排除该疾病[4]。慢性硬化性骨髓炎通常存在反复发作的疼痛和肿胀，并且疼痛不局限，可排除[5]。因而该患牙可能考虑为牙骨质结构不良诊断。牙骨质结构不良是发生于颌骨根尖周区域的特发性病变，以纤维组织和化生性骨取代正常骨组织为特征；目前病因不明，可能为牙周膜来源的非肿瘤性病损；发病率为0.24%～5.9%，好发于下颌前磨牙、磨牙区；相邻牙为活髓，牙根无吸收；其影像在骨质溶解破坏期表现为低密度透射影，边缘不整齐，牙周膜间隙和硬骨板消失，在牙骨质小体生成期病变内可见高密度点状或团块状钙化影，而在钙化成熟期根尖区以大块的钙化影为特征；病理检查为结缔组织、牙骨质样及类骨样矿化组织；硬组织形成越多，则血管化程度越低，坏死和发生骨髓炎的风险也越大[6-9]。结合临床表现、影像学特征、手术探查以及病理学报告，该病例极有可能为牙骨质结构不良。

MTA因其良好的生物相容性、封闭性、抗菌性，被广泛用于活髓保存、根尖倒充填、根尖屏障等治疗[10-11]。研究表明，MTA可促进人牙槽骨间充质干细胞、成骨细胞再矿化，从而促进根尖周新骨及牙周膜形成[12]。此外，MTA还可通过凝固过程中释放的氢氧化钙，以及溶解牙本质中的生物活性分子，如转化生长因子-β1（transforming growth factor-β1，TGF-β1）、神经生长因子（nerve growth factor，NGF）和胶质细胞系衍生生长因子（glial cell line-derived growth factor，GDNF）等，激活p38促分裂原活化蛋白激酶（mitogen activated protein kinases，MAPK）、核因子κB（nuclear factorκB，NF-κB）、Wnt /β-连环蛋白（Wnt/β-catenin）等牙本质形成、成牙本质细胞分化以及炎症反应相关的多条信号通路促进牙髓干细胞成牙本质向分化及第三期牙本质形成[13-14]。通常MTA盖髓4周后可在断面处观察到完整的修复性牙本质桥和极化的成牙本质样细胞[15]。对于牙齿而言，牙髓的完整性还必须依靠足够的血液供给[16]，这也是活髓保存的基础所在，虽然截掉患牙远中根根尖并行MTA倒充填后，将阻断由远颊根尖孔提供的血供，但剩余的近颊根、腭根仍能为患牙提供血供。充足的血供和MTA生物活性材料的应用使患牙在能够维持原有健康牙髓的基础上修复因切根及倒预备损伤的牙髓，建立新的牙髓血液循环，保存活髓并促进根尖周新骨及牙周膜的形成。对显微根尖外科手术时间的严格把控，严格的无菌操作，手术显微镜的使用，也是该患牙得以保存活髓的必要条件。

目前临床上对牙髓状态的检测，如温度测试、电测试、试验性备洞以及选择性麻醉均是基于牙齿的神经性反应，而并非血液循环状态的检测。所以牙髓的组织病理状态并不能由上述的测试准确推断，即拥有完整血运系统的牙髓在存在神经纤维的损伤或是感觉异常时，有可能被测试出没有活力。反之，如果牙髓血运系统受到损伤后，温度和电测试结果也有可能假阳性。而激光多普勒血流仪则可以不依赖于患者的主观感受，监测牙髓组织的血运状况，客观、有效、无创地判断牙髓的真实状态，进而反映其活性状态[17]。另外组织氧气监护仪可以检测牙髓组织血氧饱和度以及总血红蛋白。该病例中，由于手术、截根等机械性损伤引起的炎症反应使血管扩充，毛细血管通透性增加[18]，从而导致血细胞在牙髓组织中聚集；同时，炎症反应也可以引起局部组织水肿[19]，造成髓腔压力增大而减少静脉血回流，血细胞流动速度降低，从而血流降低；而此时牙髓腔的相对缺氧状态，也促进了携氧血红蛋白的氧离解，所以在术后1周总血红蛋白升高，而血流、血氧饱和度下降。研究表明，再血管化开始于创伤后5 d，而再神经化则开始于创伤后4周，但神经的完全恢复通常在损伤后的1年及其以上时间，因而对创伤后牙齿的长期随访尤为重要[20-21]。该病例术后4年随访复查的血流值及电测试均表明其再血管化、再神经化以及牙髓修复已成功。

4　小　结

随着诊断及临床技术的提高，临床医生尤其是牙体牙髓专科医生对根尖阴影类疾病不宜轻易地进行根管治疗，此时应该积极寻找病原牙，而当无确定病原牙时，采用有效的牙髓状态评估手段对病变累及牙齿的牙髓状态进行准确评估则显得尤为重要。此外还应详细地询问系统疾病史（可排除肿瘤的转移等）、外伤史、正畸治疗史，仔细研读患者影像学信息并结合临床表现诊断及鉴别诊断，确定最终治疗方案。本研究病例16活髓伴远颊根尖区透射影合并局部牙骨质结构不良行显微根尖外科手术探查下保存活髓的治疗方式也为后续此类疾病的治疗提供了新的思路和参考，在清

理病变的同时为患牙保存活髓，使其行使正常生理功能。

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